



**PHOTOFACT<sup>®</sup> with**

**CIRCUITRACE<sup>®</sup>**

For Supplier Address See PHOTOFACT Index

**NOTE**

Repair or adjustment of transmitter circuits must be under supervision of a person with first-or second-class radiotelephone license.  
(Refer to FCC Rules and Regulations Part 95, Subpart C & D.)

The frequency of the transmitter should be checked periodically with a secondary frequency standard to insure proper and legal operation.

Best results will be obtained when adjusting the final RF output circuit if the antenna normally used is connected and the chassis is as nearly in the cabinet as possible.

Connect either 50-ohm dummy load or the normally used antenna system.



MODEL 1010002, MADISON

PRESIDENT MODEL 1010002, MADISON

**HOWARD W. SAMS & CO., INC.** Indianapolis, Indiana 46206

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## ALIGNMENT INSTRUCTIONS

Adjust RT301 for 13.8 volts DC at TP12.  
Connect low sides of test equipment to ground unless specified otherwise.  
Connect 50-ohm dummy load or antenna before keying transmitter.  
Connect microphone.

Suggested Alignment Tools: GC ELECTRONICS:

L1, L2 L4 thru L10, L12, L14, L19 thru L23, L30, L31, L45 thru L48 ..... 9440  
L3, L13, L15 ..... 5000, 5009 8276, 8728, 8728A  
L36, L38 ..... 5009, 8728, 8728A  
CT1, CT2 ..... 5000, 8276

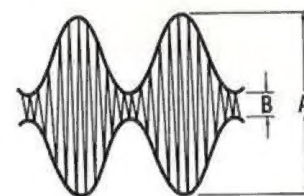


FIGURE 1

## SYNTHESIZER ALIGNMENT

TEST EQUIPMENT	TRANSCEIVER	ADJUST	REMARKS
Input of frequency counter to TP13 (IC1 Pin 8).	Ch. 19		Check for 10.240MHz.
Input of oscilloscope to TP10.	Ch. 19, AM	L21	Adjust for maximum RF.
Input of DC meter to TP9.	Ch. 40, AM	L19	Adjust for 5.00 volts. Check for approximately 3.40 volts on Channel 1.
Input of oscilloscope to TP1.	Ch. 19, AM	L20	Adjust for maximum RF.
Input of frequency counter to TP1.	Ch. 1, AM	L23	Adjust for 34.7650MHz +20Hz. Check all channels. (See Truth Chart for correct frequencies.)
Input of frequency counter to TP1.	Ch. 1, USB	CT1	Adjust for 34.7665MHz +20Hz. Check all channels. (See Truth Chart for correct frequencies.)
Input of frequency counter to TP1.	Ch. 1, LSB	L22	Adjust for 34.7635MHz +20Hz. Check all channels. (See Truth Chart for correct frequencies.)
Input of frequency counter to TP10	Ch. 1, AM		Check for .790MHz. Check all channels. (See Truth Chart for correct frequencies.)
Input of frequency counter to TP15 (FET1 gate 1).	Ch. 19, AM		Check for 7.3450MHz.
Input of frequency counter to TP3.	Ch. 19, USB	CT2	Adjust for 7.8015MHz +5Hz, -0Hz.
Input of frequency counter to TP3.	Ch. 19, LSB	L30	Adjust for 7.7985MHz +0Hz, -5Hz.
Input of frequency counter to TP14 (IC3 Pin 3).	Ch. 19, AM XMT	L31	Disconnect TP7 and TP8. Adjust for 7.8000MHz +5Hz.
Input of frequency counter to antenna input.	Ch. 19, AM XMT	VR5	Adjust for 27.185MHz.

## RECEIVER ALIGNMENT

Connect an AC VTVM or AF wattmeter across speaker voice coil.  
Adjust volume control to obtain a suitable indication. Set generator output low enough to prevent AGC limiting. Preset controls as follows, unless otherwise noted: RF Gain Maximum, Clarifier Midrange, Squelch MINIMUM, NB/ANL Off, Ch. 9 Off.

TEST EQUIPMENT	TRANSCEIVER	ADJUST	REMARKS
Output of signal generator thru .01uF to TP16 (TR15 Emitter). 7.8MHz, no modulation.	Ch. 19, USB	L14, L12, L10, L9, L8, L7	Adjust for maximum output.
Output of signal generator thru .01uF to TP15 (FET1 gate 1). 455kHz, 1000Hz @ 30% modulation.	Ch. 19, AM	L15, L13, L3	Adjust for maximum output.
Output of signal generator thru .01uF to antenna input. 27.185MHz, 1000Hz @ 30% modulation.	Ch. 19, AM	L6, L5, L4	Adjust for maximum output.
Output of signal generator thru .01uF to antenna input. 27.185MHz, 1000Hz @ 30% modulation. Input of oscilloscope to TP17 (D2 Cathode).	Ch. 19, AM	L1, L2	Set generator for 10db signal to noise plus noise ratio of receiver. Inject a 100pps, 1uSec, pu pulse width signal at antenna input. Switch Noise Blanker to On and adjust for maximum pulse amplitude.

## RECEIVER ADJUSTMENTS

Connect an AC VTVM or AF wattmeter across speaker voice coil.  
Adjust volume control to obtain a suitable indication. Preset controls as follows, unless otherwise noted: RF Gain Maximum, Clarifier Midrange, Squelch MINIMUM, NB/ANL Off, Ch. 9 Off.

TEST EQUIPMENT	TRANSCEIVER	ADJUST	REMARKS
Output of signal generator thru .01uF to antenna input. 27.185MHz, 1000Hz @ 30% modulation. Output 1000uV.	Ch. 19, AM Squelch Maximum	VR3	SQUELCH RANGE Adjust so that squelch just breaks.
Output of signal generator thru .01uF to antenna input. 27.185MHz, 1000Hz @ 30% modulation. Output 100uV.	Ch. 19, AM	VR1	AM SIGNAL METER Adjust for 9 on Signal scale of meter.
Output of signal generator thru .01uF to antenna jack. 27.186MHz, no modulation. Output 100uV.	Ch. 19, USB	VR2	SSB SIGNAL METER Adjust for 9 on Signal scale of meter.



## TRANSMITTER ALIGNMENT

Connect an RF wattmeter and 50-ohm, 25-watt dummy load to antenna connector.  
NOTE: Be sure to check transmit frequency and power on all active channels after alignment of transmitter.  
See page 4 for channel frequencies.

TEST EQUIPMENT	TRANSCIVER	ADJUST	REMARKS
Input of RF wattmeter to antenna input.	Ch. 19, AM	L47,L48,L46, L45,L38	Adjust for maximum RF output.
Input of spectrum analyzer or harmonic meter to antenna input.	Ch. 19, AM	L36	Adjust for MINIMUM at 54MHz (2nd harmonic).

## TRANSMITTER ADJUSTMENTS

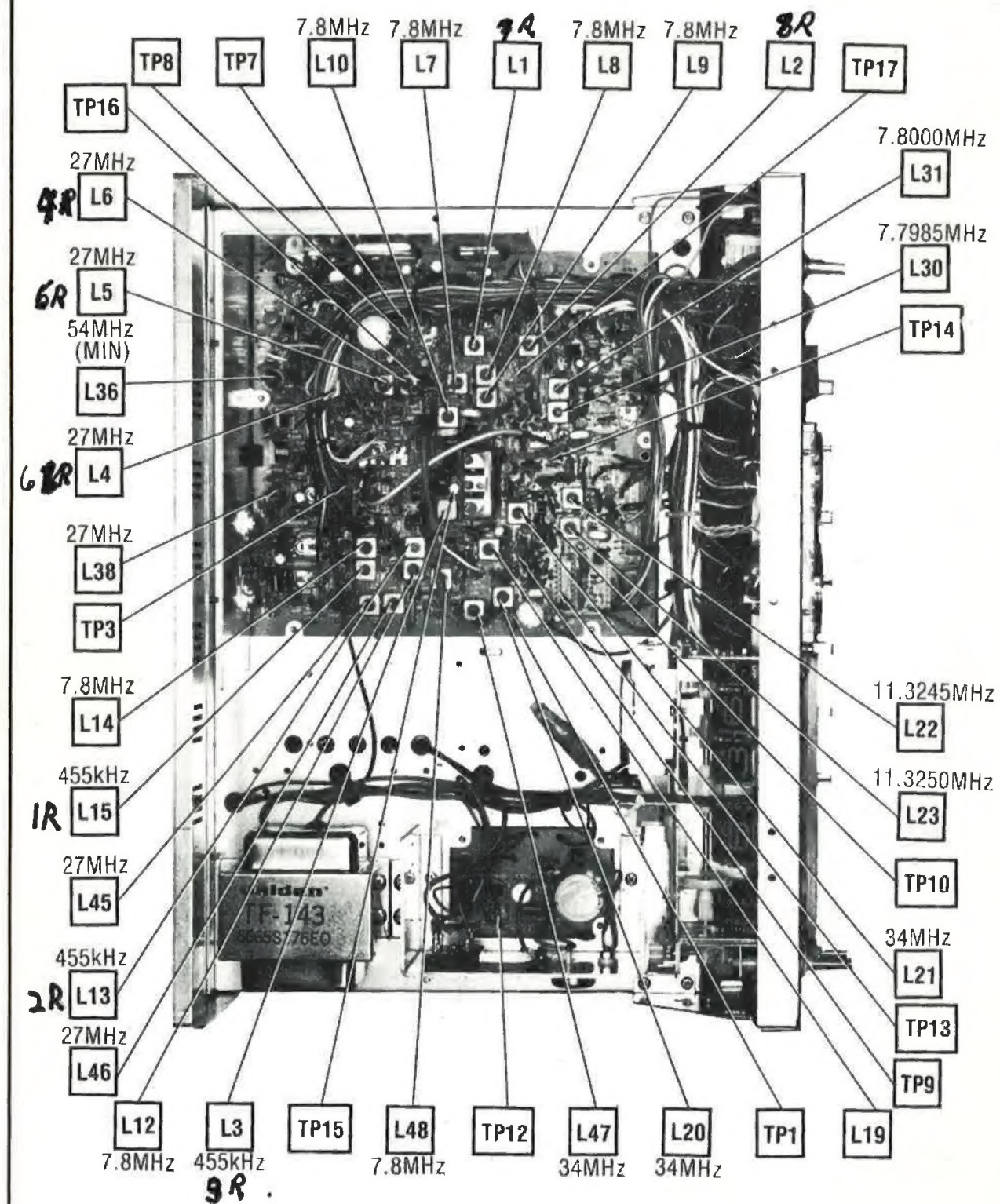
Connect a 50-ohm, 25-watt dummy load to antenna connector.  
NOTE: Be sure to check transmit frequency and power on all active channels after adjustment of transmitter.  
See page 4 for channel frequencies.

TEST EQUIPMENT	TRANSCIVER	ADJUST	REMARKS
Input of RF wattmeter to antenna input. No modulation.	Ch. 19, USB Mike Gain MINIMUM	VR4	CARRIER BALANCE Adjust for MINIMUM RF output.
Input of RF wattmeter to antenna input. Insert a 0-500mA DC meter at TP8. No modulation.	Ch. 19, USB Mike Gain MINIMUM	VR9	DRIVER BIAS Adjust for 25mA.
Input of RF wattmeter to antenna input. Insert a 0-500mA DC meter at TP7. No modulation.	Ch. 19, USB Mike Gain MINIMUM	VR8	FINAL BIAS Adjust for 50mA.
Input of RF wattmeter to antenna input. Inject a two tone, 500mV signal at Mic input.	Ch. 19 USB Mike Gain Maximum	VR11	SSB ALC Adjust for 11.0 watts PEP RF output maximum.
Input of RF wattmeter to antenna input.	Ch. 19, AM Mike Gain MINIMUM	VR10	AM CARRIER POWER Adjust for 4.0 watts RF output maximum.
Input of RF wattmeter to antenna input.	Ch. 19, AM	VR6	RF PWR METER Adjust so that RF PWR Meter agrees with RF wattmeter.
Input of oscilloscope or modulation meter to antenna input. Inject a 1000Hz signal at Mic input with enough output to produce 100% modulation. See Figure 1.	Ch. 19, AM Mike Gain Maximum SWR-RF/MOD MOD	VR7	MOD METER Adjust for 100% on MOD scale of meter.
Connect a 150 ohm non-inductive resistor to antenna input.	Ch. 19, AM	VR12	AWI Adjust so that AWI indicator just comes on.

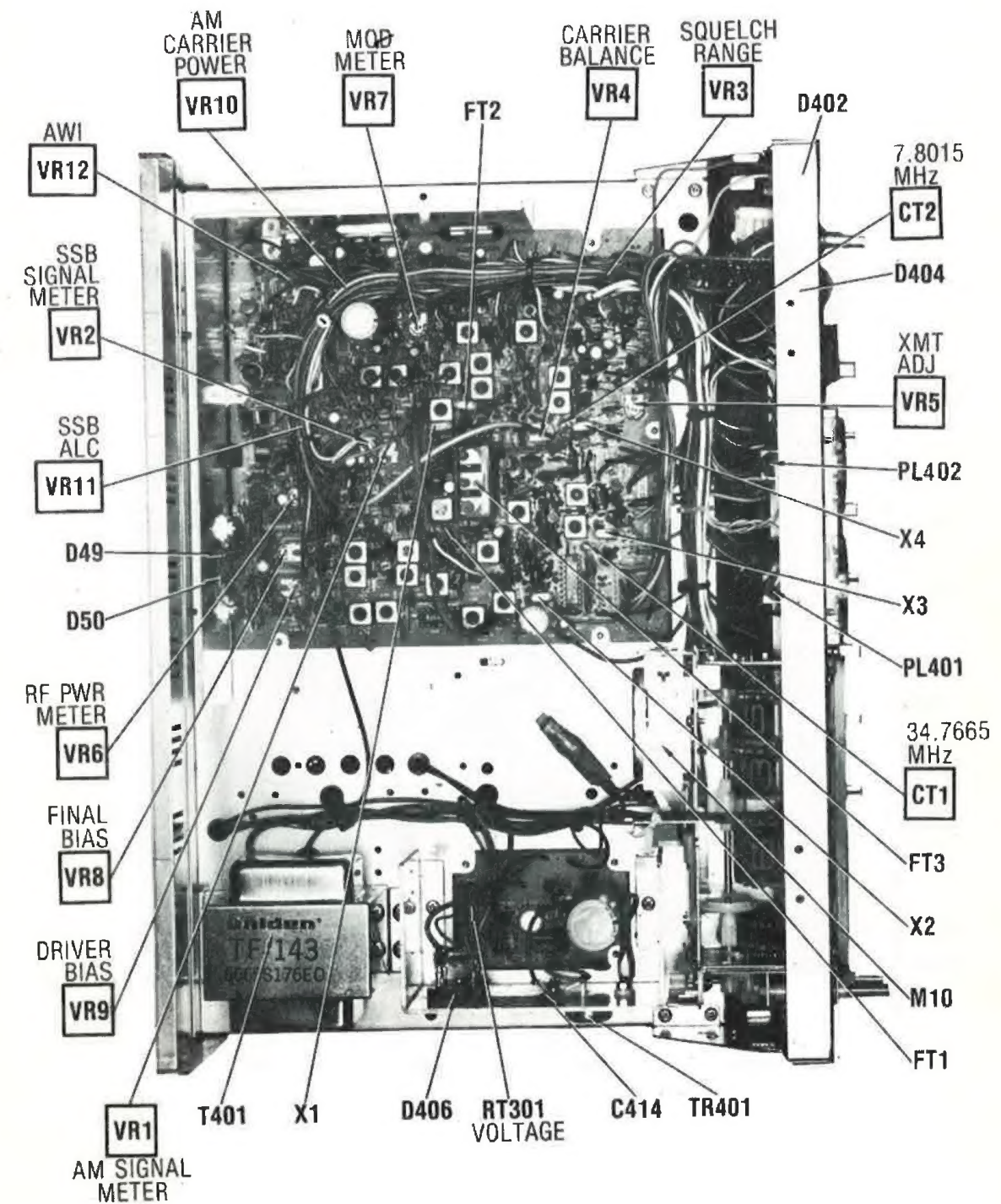
## TRUTH CHART

CHANNEL	1 = 8.00 Volts    0 = 0 to .50 Volts PROGRAM DIVIDER IC1								AM REC SYNTH OUTPUT IN MHz AT @ TP1	USB REC SYNTH OUTPUT IN MHz AT @ TP1	LSB REC SYNTH OUTPUT IN MHz AT @ TP1	DIVIDER INPUT IN MHz AT TP10
	PINS											
		10	11	12	13	14	15	16				
1		1	0	0	1	1	1	1	34.7650	34.7665	34.7635	.790
2		1	0	1	0	0	0	0	34.7750	34.7765	34.7735	.800
3		1	0	1	0	0	0	1	34.7850	34.7865	34.7835	.810
4		1	0	1	0	0	1	1	34.8050	34.8065	34.8035	.830
5		1	0	1	0	1	0	0	34.8150	34.8165	34.8135	.840
6		1	0	1	0	1	0	1	34.8250	34.8265	34.8235	.850
7		1	0	1	0	1	1	0	34.8350	34.8365	34.8335	.860
8		1	0	1	1	0	0	0	34.8550	34.8565	34.8535	.880
9		1	0	1	1	0	0	1	34.8650	34.8665	34.8635	.890
10		1	0	1	1	0	1	0	34.8750	34.8765	34.8735	.900
11		1	0	1	1	0	1	1	34.8850	34.8865	34.8835	.910
12		1	0	1	1	1	0	1	34.9050	34.9065	34.9035	.930
13		1	0	1	1	1	1	0	34.9150	34.9165	34.9135	.940
14		1	0	1	1	1	1	1	34.9250	34.9265	34.9235	.950
15		1	1	0	0	0	0	0	34.9350	34.9365	34.9335	.960
16		1	1	0	0	0	1	0	34.9550	34.9565	34.9535	.980
17		1	1	0	0	0	1	1	34.9650	34.9665	34.9635	.990
18		1	1	0	0	1	0	0	34.9750	34.9765	34.9735	1.000
19		1	1	0	0	1	0	1	34.9850	34.9865	34.9835	1.010
20		1	1	0	0	1	1	1	35.0050	35.0065	35.0035	1.030
21		1	1	0	1	0	0	0	35.0150	35.0165	35.0135	1.040
22		1	1	0	1	0	0	1	35.0250	35.0265	35.0235	1.050
23		1	1	0	1	1	0	0	35.0550	35.0565	35.0535	1.080
24		1	1	0	1	0	1	0	35.0350	35.0365	35.0335	1.060
25		1	1	0	1	0	1	1	35.0450	35.0465	35.0435	1.070
26		1	1	0	1	1	0	1	35.0650	35.0665	35.0635	1.090
27		1	1	0	1	1	1	0	35.0750	35.0765	35.0735	1.100
28		1	1	0	1	1	1	1	35.0850	35.0865	35.0835	1.110
29		1	1	1	0	0	0	0	35.0950	35.0965	35.0935	1.120
30		1	1	1	0	0	0	1	35.1050	35.1065	35.1035	1.130
31		1	1	1	0	0	1	0	35.1150	35.1165	35.1135	1.140
32		1	1	1	0	0	1	1	35.1250	35.1265	35.1235	1.150
33		1	1	1	0	1	0	0	35.1350	35.1365	35.1335	1.160
34		1	1	1	0	1	0	1	35.1450	35.1465	35.1435	1.170
35		1	1	1	0	1	1	0	35.1550	35.1565	35.1535	1.180
36		1	1	1	0	1	1	1	35.1650	35.1665	35.1635	1.190
37		1	1	1	1	0	0	0	35.1750	35.1765	35.1735	1.200
38		1	1	1	1	0	0	1	35.1850	35.1865	35.1835	1.210
39		1	1	1	1	0	1	0	35.1950	35.1965	35.1935	1.220
40		1	1	1	1	0	1	1	35.2050	35.2065	35.2035	1.230



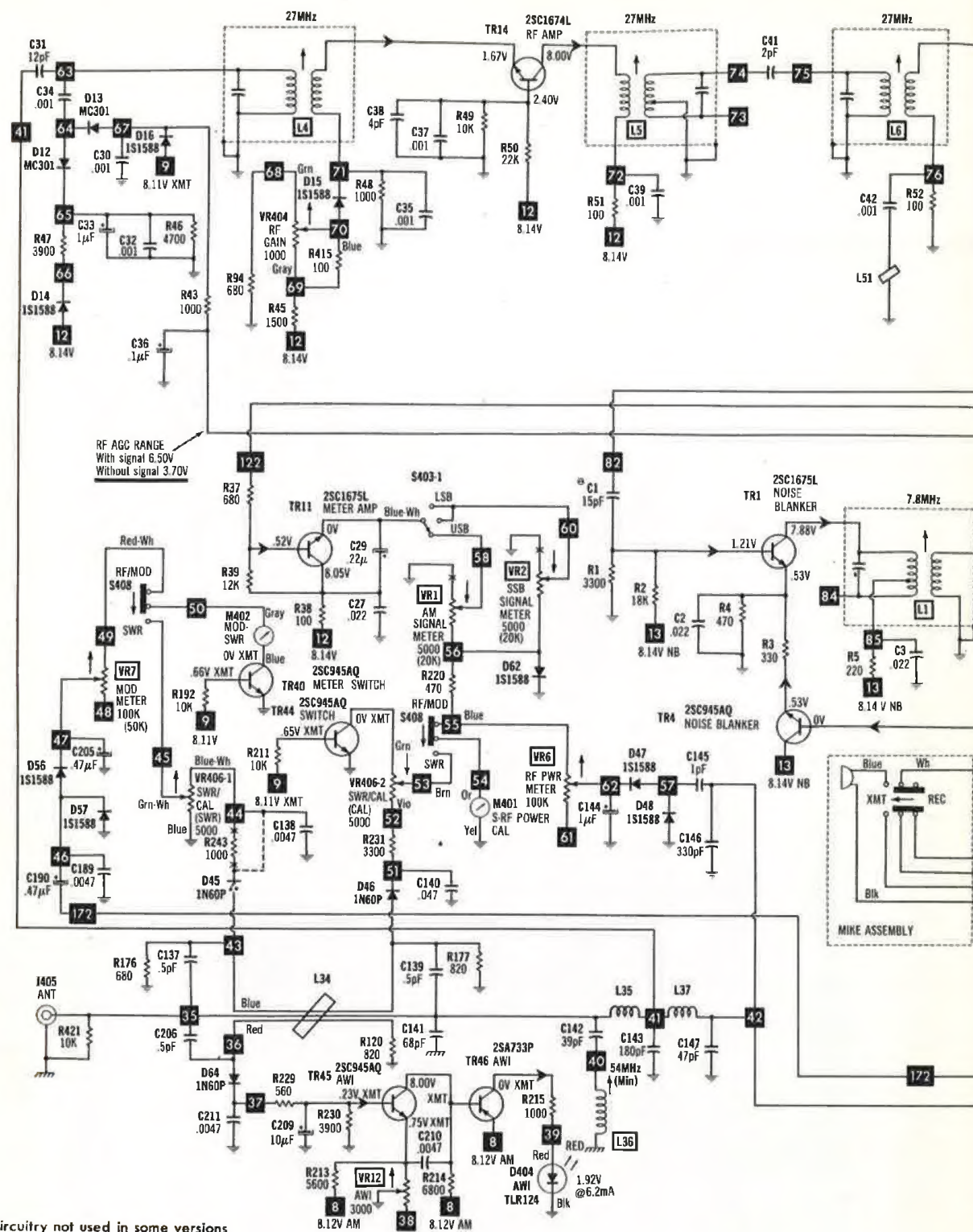


CHASSIS-TOP



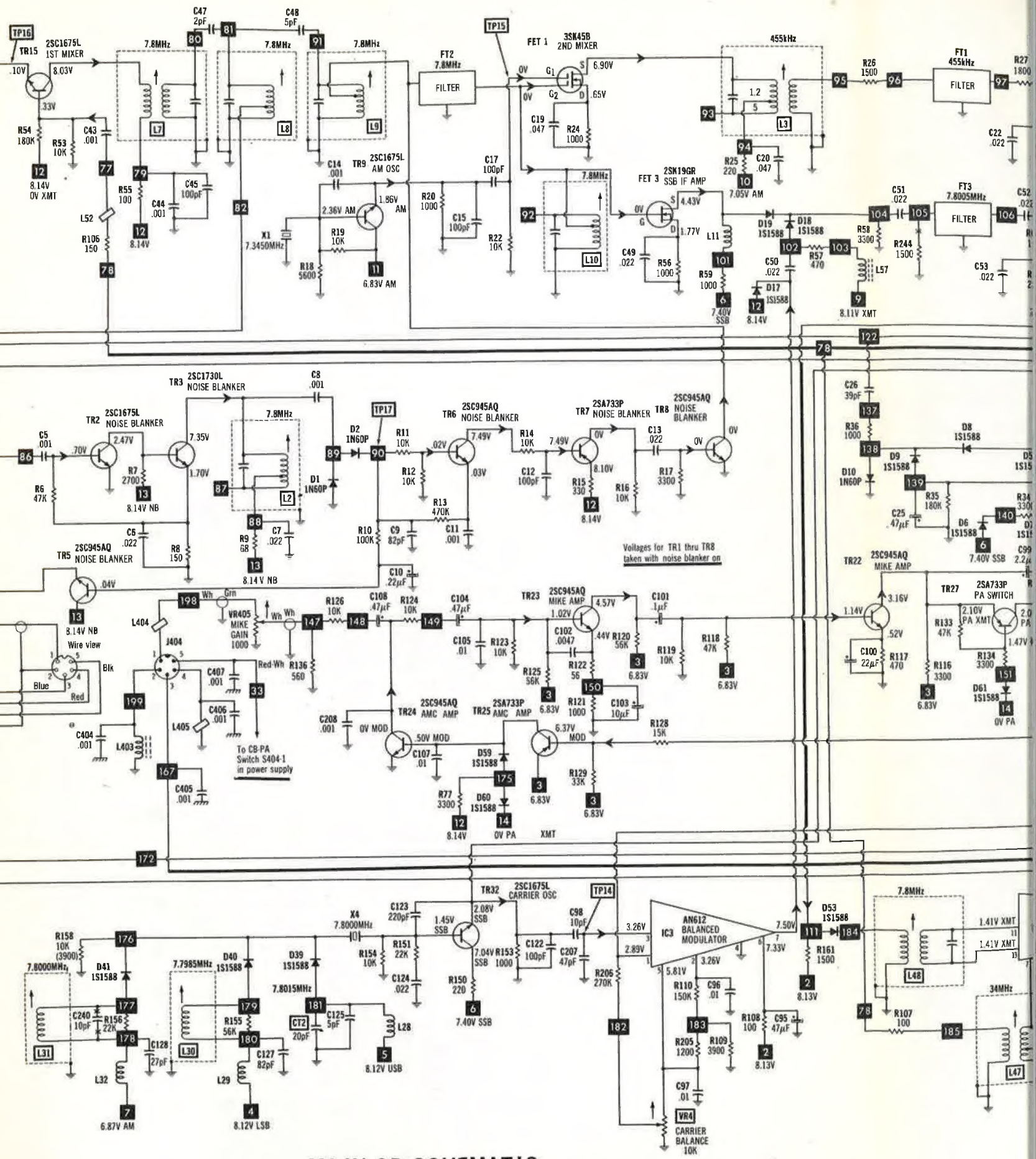
CHASSIS-TOP





- ✱ Circuitry not used in some versions
- Circuitry used in some versions
- ⊙ See parts list
- ✱ Nominal value
- ⊕ Ground
- ⌞ Chassis
- ⋈ Common tie point
- Signal path
- ⤴ Voltage path

Measurements made in Channel 1 with switching as shown unless noted.  
Item numbers in rectangles appear in the alignment/adjustment instructions.  
Supply voltage maintained as shown at input.  
Voltages measured with digital meter, no signal.  
Controls adjusted for normal operation.  
Arrow at control indicates direction of advance.  
Terminal identification may not be found on unit.  
Resistors are 1/2W or less, 5% unless noted.  
Value in ( ) used in some versions.



# MA IN CB SCHEMATIC



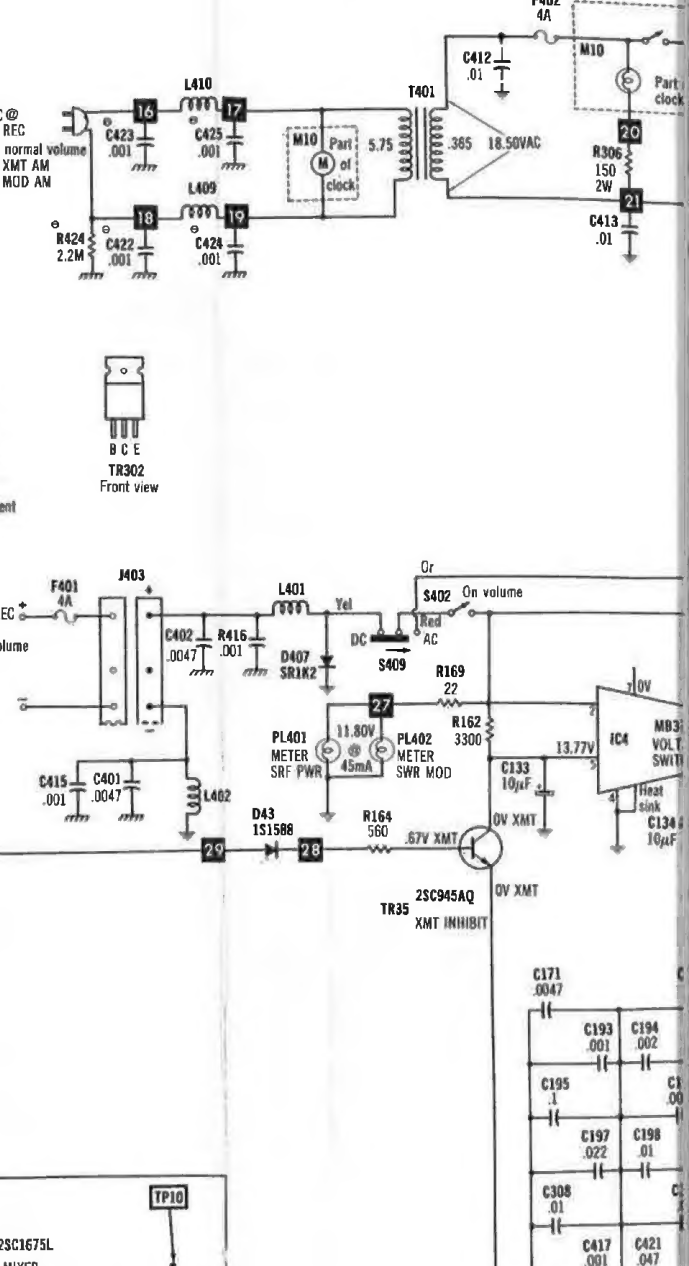
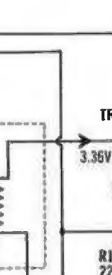
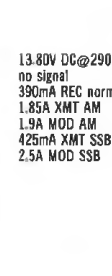
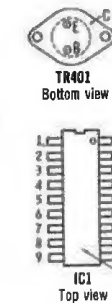
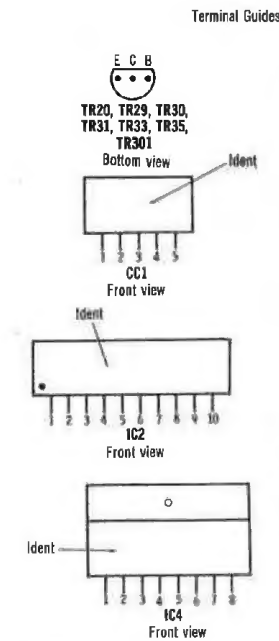
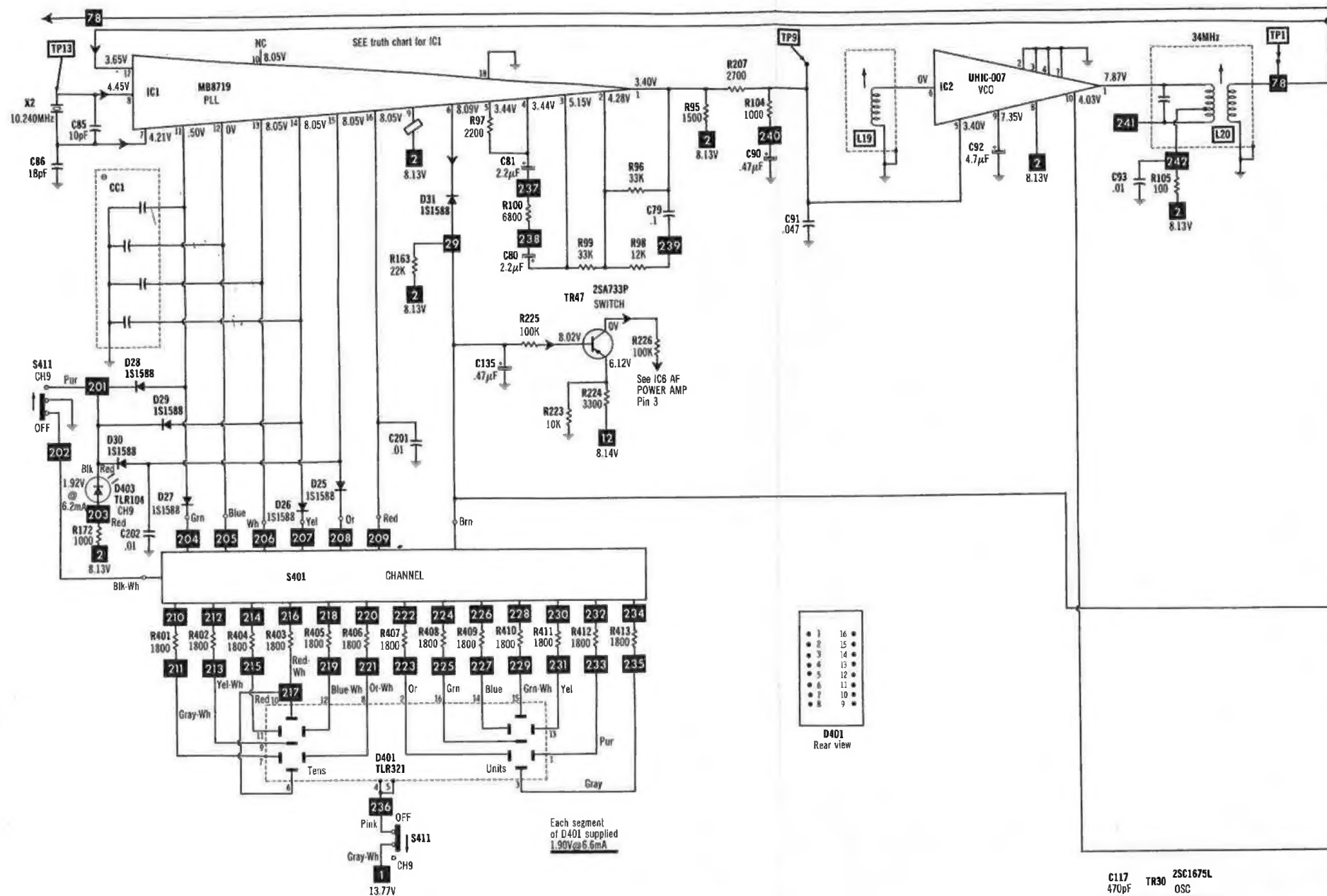




\* Circuitry not used in some versions  
 --- Circuitry used in some versions  
 e See parts list  
 \* Nominal value  
 G Ground  
 Ch Chassis  
 Common tie point  
 Signal path  
 Voltage path  
 Measurements made in Channel 1 with switching as shown unless noted.  
 Item numbers in rectangles appear in the alignment/adjustment instructions.  
 Supply voltage maintained as shown at input.  
 Voltages measured with digital meter, no signal.  
 Controls adjusted for normal operation.  
 Arrow at control indicates direction of advance.  
 Terminal identification may not be found on unit.  
 Resistors are 1/2W or less, 5% unless noted.  
 Value in ( ) used in some versions.

A PHOTOFAC STANDARD NOTATION SCHEMATIC  
 WITH **CIRCUITRACE**  
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## PLL SCHEMATIC



## POWER SUP





(When ordering parts, state Model, Part Number, and Description.)

ITEM No.	TYPE No.	MFG. PART No.	REPLACEMENT DATA										WORKMAN PART No.	ZENITH PART No.
			GENERAL ELECTRIC PART No.	MALLORY PART No.	MOTOROLA PART No.	RAYTHEON PART No.	RCA PART No.	SPRAGUE PART No.	SYLVANIA PART No.	THORDARSON PART No.				
D25	1S1588 1S2473 1S2472 1S953 1S1588 1S2473 1S2472 1S953	2000-332	GE-514 GE-514 GE-514 GE-300 GE-514 GE-514 GE-514 GE-300	PTC214 PTC214 PTC214 PTC214 PTC214 PTC214 PTC214 PTC214	HEPR0602 HEPR0602 HEPR0602 HEPR0602 HEPR0602 HEPR0602 HEPR0602 HEPR0602	REN 177 REN 177 REN 177 REN 177 REN 177 REN 177 REN 177 REN 177	SK3100 SK3100 SK3100 SK3100 SK3100 SK3100 SK3100 SK3100	RT-218 RT-218 RT-218 RT-218 RT-218 RT-218 RT-218 RT-218	ECG519 ECG519 ECG519 ECG177 ECG519 ECG519 ECG519 ECG177	TM519 TM519 TM519 TM177 TM519 TM519 TM519 TM177	WEP925 WEP925 WEP925 WEP1062 WEP925 WEP925 WEP925 WEP1062	103-287 103-287 103-287 103-131 103-287 103-287 103-287 103-131		
D26	1S1588 1S2473 1S2472 1S953	2000-332	GE-514 GE-514 GE-514 GE-300	PTC214 PTC214 PTC214 PTC214	HEPR0602 HEPR0602 HEPR0602 HEPR0602	REN 177 REN 177 REN 177 REN 177	SK3100 SK3100 SK3100 SK3100	RT-218 RT-218 RT-218 RT-218	ECG519 ECG519 ECG519 ECG177	TM519 TM519 TM519 TM177	WEP925 WEP925 WEP925 WEP1062	103-287 103-287 103-287 103-131		
D27	1S1588 1S2473 1S2472 1S953	2000-332	GE-514 GE-514 GE-514 GE-300	PTC214 PTC214 PTC214 PTC214	HEPR0602 HEPR0602 HEPR0602 HEPR0602	REN 177 REN 177 REN 177 REN 177	SK3100 SK3100 SK3100 SK3100	RT-218 RT-218 RT-218 RT-218	ECG519 ECG519 ECG519 ECG177	TM519 TM519 TM519 TM177	WEP925 WEP925 WEP925 WEP1062	103-287 103-287 103-287 103-131		
D28	1S1588 1S2473 1S2472 1S953	2000-332	GE-514 GE-514 GE-514 GE-300	PTC214 PTC214 PTC214 PTC214	HEPR0602 HEPR0602 HEPR0602 HEPR0602	REN 177 REN 177 REN 177 REN 177	SK3100 SK3100 SK3100 SK3100	RT-218 RT-218 RT-218 RT-218	ECG519 ECG519 ECG519 ECG177	TM519 TM519 TM519 TM177	WEP925 WEP925 WEP925 WEP1062	103-287 103-287 103-287 103-131		
D29	1S1588 1S2473 1S2472 1S953	2000-332	GE-514 GE-514 GE-514 GE-300	PTC214 PTC214 PTC214 PTC214	HEPR0602 HEPR0602 HEPR0602 HEPR0602	REN 177 REN 177 REN 177 REN 177	SK3100 SK3100 SK3100 SK3100	RT-218 RT-218 RT-218 RT-218	ECG519 ECG519 ECG519 ECG177	TM519 TM519 TM519 TM177	WEP925 WEP925 WEP925 WEP1062	103-287 103-287 103-287 103-131		
D30	1S1588 1S2473 1S2472 1S953	2000-332	GE-514 GE-514 GE-514 GE-300	PTC214 PTC214 PTC214 PTC214	HEPR0602 HEPR0602 HEPR0602 HEPR0602	REN 177 REN 177 REN 177 REN 177	SK3100 SK3100 SK3100 SK3100	RT-218 RT-218 RT-218 RT-218	ECG519 ECG519 ECG519 ECG177	TM519 TM519 TM519 TM177	WEP925 WEP925 WEP925 WEP1062	103-287 103-287 103-287 103-131		
D31	1S1588 1S2473 1S2472 1S953	2000-332	GE-514 GE-514 GE-514 GE-300	PTC214 PTC214 PTC214 PTC214	HEPR0602 HEPR0602 HEPR0602 HEPR0602	REN 177 REN 177 REN 177 REN 177	SK3100 SK3100 SK3100 SK3100	RT-218 RT-218 RT-218 RT-218	ECG519 ECG519 ECG519 ECG177	TM519 TM519 TM519 TM177	WEP925 WEP925 WEP925 WEP1062	103-287 103-287 103-287 103-131		
D32	1S1588 1S2473 1S2472 1S953	2000-332	GE-514 GE-514 GE-514 GE-300	PTC214 PTC214 PTC214 PTC214	HEPR0602 HEPR0602 HEPR0602 HEPR0602	REN 177 REN 177 REN 177 REN 177	SK3100 SK3100 SK3100 SK3100	RT-218 RT-218 RT-218 RT-218	ECG519 ECG519 ECG519 ECG177	TM519 TM519 TM519 TM177	WEP925 WEP925 WEP925 WEP1062	103-287 103-287 103-287 103-131		
D33	1S1588 1S2473 1S2472 1S953	2000-332	GE-514 GE-514 GE-514 GE-300	PTC214 PTC214 PTC214 PTC214	HEPR0602 HEPR0602 HEPR0602 HEPR0602	REN 177 REN 177 REN 177 REN 177	SK3100 SK3100 SK3100 SK3100	RT-218 RT-218 RT-218 RT-218	ECG519 ECG519 ECG519 ECG177	TM519 TM519 TM519 TM177	WEP925 WEP925 WEP925 WEP1062	103-287 103-287 103-287 103-131		
D34	1S1588 1S2473													